# NETWORK STANDARDS AND MODELS

## PROJECTS

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## Project 2.1 Understanding Key Concepts

### Overview
Today, manufacturers design and build PCs and operating systems with the assumption that they’ll be deployed in a network environment. As a result, understanding network fundamentals, beginning with fundamental terms and concepts, is important.

### Outcomes
After completing this project, you will know how to:
- Identify key terms and concepts related to models and standards
- Identify key terms and concepts related to the OSI and Internet networking models

### What you’ll need
To complete this project, you will need:
- The following worksheet

### Completion time
20 minutes

### Precautions
None

The worksheet includes a list of networking terms on the left and descriptions on the right. Match each term with the description that it most closely matches. You will *not* use all descriptions. Each description can only be used once.

| ___   | Connectionless transmission | A. Process of inserting markers into data packets to enable a conversation to continue after errors |
| ___   | Flow control               | B. Communication sessions using connection-oriented transmissions |
| ___   | Logical address            | C. Two-way data communication where both ends can transmit simultaneously |
| ___   | MAC address                | D. Transmission method where the receiving system does not acknowledge receipt of data |
| ___   | Hop                        | E. Standard developed and accepted through use and application |
| ___   | Ethernet                   | F. TCP/IP suite protocol used to access web pages |
| ___   | Data compression            | G. Method of ensuring that data sent to the recipient is in a format that the recipient can process |
| ___   | Data encryption             | H. Address assigned to a computer through networking software and uniquely identifying the computer to the network |
| __ | Header | I. Standard developed by an official body |
| __ | Reliable transport method | J. Using algorithms to modify data from being ready by anyone other than the sender and intended recipient |
| __ | Data presentation | K. Router passed through during packet routing |
| __ | HTTP | L. Common term for the IEEE 802.3 networking standard |
| __ | Formal standard | M. Term used to refer to data packets at the OSI network layer |
| __ | De facto standard | N. Act of physically shrinking data to minimize network traffic |
| __ | Routing | O. Communication control that prevents a computer from being overwhelmed by incoming traffic |
| __ | Full-duplex communication | P. Information added to describe a data packet, including source and destination computers |

Q. Process of directing packets through an internetwork to the correct destination network

R. Network device address that is hard coded on the network adapter

### Project 2.2 Comparing Network Models

| Overview | Standards can be developed by a formal standards organization or come into being through common acceptance and use. Standards have been an important part of network design and development. They help to ensure interoperability between different manufacturers’ products. They provide standard, accepted terms for describing network functions and network activity. In short, they provide a standard language for discussing networking. Three common network model standards are the **OSI model**, the **DoD model**, and the **Internet model**. You need to understand each of these models, how they are structured, and what occurs at each level. |

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>After completing this project, you will know how to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲</td>
<td>identify network model layered structures</td>
</tr>
<tr>
<td>▲</td>
<td>recognize activities occurring at different model layers</td>
</tr>
</tbody>
</table>
What you’ll need  To complete this project, you will need:

- the following worksheet

<table>
<thead>
<tr>
<th>Completion time</th>
<th>45 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precautions</td>
<td>None</td>
</tr>
</tbody>
</table>

Part A: Identify Model Layers

In Figure 2-1, fill in the names for each of the model layers in their correct positions. The names follow the figure. All names will be used. Each name may be used more than once.

![Figure 2-1: Networking models](image)

- Application
- Data Link
- Host-to-Host
- Internet
- Network
- Network interface
- Physical
- Presentation
- Process
- Session
- Transport
Part B: Understand Layer Use

The following questions refer to network technologies and their relationship with the OSI, DoD, and Internet network models. Answer each question and briefly explain your answer.

1. Why can we say that the NetBEUI protocol does not implement the OSI model Network layer?

2. Which layer in the OSI and Internet models is not considered a layer in the DoD model?

3. At which layer are Ethernet and WiFi implemented in the OSI model?

4. Into what sublayers is the OSI model Data Link layer divided?

5. In the OSI model, with what other layers does the Transport layer directly interface?

6. During the routing process, while passing through a router, datagrams pass through which layers of the Internet model?

7. Which two protocols in the TCP/IP protocol suite operate at the Host-to-Host layer of the DoD model?
8. Tools that translate an Internet Universal Resource Locator (URL) address to a numeric IP address are provided at which layer of the OSI model?

___________________________________________________________________________
___________________________________________________________________________

9. What is the relationship between the OSI, DoD, and Internet model Application layers?

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________

10. At which layer are IP addresses defined in the DoD model?

___________________________________________________________________________

<table>
<thead>
<tr>
<th>Project 2.3</th>
<th>Installing Windows 7 Professional or Windows 7 Enterprise Professional or Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>Microsoft Windows 7 Professional or Windows 7 Enterprise in all its versions is popular choices for network clients. One of the keys to having a reliable network is proper installation of client software—in this case, Windows 7 Professional or Windows 7 Enterprise Professional or Enterprise. You are prompted for network configuration information during Windows 7 Professional or Windows 7 Enterprise configuration. You can set configuration parameters at that time, but you also have the option of going back and changing your network configuration as needed. <strong>Note:</strong> For the networking projects found in this project manual to work properly, you should use the Enterprise version.</td>
</tr>
<tr>
<td>Outcomes</td>
<td>After completing this project, you will know how to: ▲ install Windows 7 Professional or Windows 7 Enterprise Professional or Enterprise as a virtual machine ▲ configure networking parameters ▲ verify successful installation</td>
</tr>
<tr>
<td>What you’ll need</td>
<td>To complete this project, you will need: ▲ network cable plant and connection devices installed (or Project 1.4 completed) ▲ a Windows 7 Professional or Windows 7 Enterprise installation CD</td>
</tr>
<tr>
<td>Completion time</td>
<td>60 minutes (approximate, depending on your computer’s configuration and speed)</td>
</tr>
</tbody>
</table>
Precautions

The instructions in this project assume you will be setting up a two-node network with one computer running Windows 7 Professional or Windows 7 Enterprise Professional or Enterprise and one computer running Windows Server 2008. If you are deploying the Windows 7 Professional or Windows 7 Enterprise computer as part of a larger classroom network, your instructor will provide you with alternate instructions for configuring network parameters.

If you are adding the Windows 7 Professional or Windows 7 Enterprise computer to an existing network, you should also review the project steps with your network administrator. Your network administrator may need to make changes or additions to the installation instructions.

Part A: Prepare for Installation

This project provides instructions for installing Windows 7 Professional or Windows 7 Enterprise Professional or Enterprise from the installation CD and configuring networking parameters. Required parameters include the computer name and TCP/IP address parameters. Your instructor may provide alternate values for some configuration parameters. If so, record them here:

- Computer name: __________________________
- IP address: __________________________
- Subnet mask: __________________________

This project assumes that you will be configuring the computer with a single disk partition. If your computer needs to be configured differently, your instructor will provide you with alternate partitioning instructions. These alternate instructions replace Steps 4 through 7 below.

Part B: Install Windows 7 Professional or Windows 7 Enterprise

1. Open your VMWare Player.
2. Choose Create a New Virtual Machine and then choose either Installer Disc if you have access to a Windows 7 Professional or Windows 7 Enterprise Install DVD or Installer Disc Image file (iso) if you downloaded the Demo Windows 7 Professional or Windows 7 Enterprise file referred to earlier. Refer to Figure 2-2.
3. Name your installation **User 1** or the instructor assigned name and number. Use **P@SSwθrd** (θ = zero) for your password. If you have access to a Windows Product Key, enter it here, as shown in Figure 2-3.

![Figure 2-2: New Virtual Machine Wizard](image)

**Figure 2-2: New Virtual Machine Wizard**

![Figure 2-3: New Virtual Machine Wizard: Easy Install Information](image)

**Figure 2-3: New Virtual Machine Wizard: Easy Install Information**

*Note:* If you do not have access to a key, you can still install Windows 7 Professional or Windows 7 Enterprise, but you’ll be unable to activate it later. Be sure that you enter the product key to activate Windows within the 30-day grace period. After the 30-day grace period ends, your system will not boot, and you may have to reinstall the copy again.
4. Leave the default name as Windows 7 Professional or Windows 7 Enterprise and choose a location to store your virtual machine. In this case it’s being saved to a removable hard drive in a file called “My Virtual Machines\Windows 7 Professional or Windows 7 Enterprise.” See Figure 2-4 for an example.

![Figure 2-4: New Virtual Machine Wizard: Name the virtual machine](image1)

5. Accept the default size for the virtual hard drive and storage, as shown in Figure 2-5.

![Figure 2-5: New Virtual Machine Wizard: Specify disk capacity](image2)

6. In some cases, for a complete installation customizing the hardware is necessary. To do so, click on the **Customize Hardware** button from the next window, as shown in Figure 2-6.
7. Choose the **New CD/DVD**, and click the **Advance** button.
8. Choose the **Legacy Emulation** radial and click **OK**.
9. Highlight the **Network Adapter** and click on the **Host Only** radial.
10. Click **OK** and finish.
11. You will first see a window with the peripheral on your computer and then likely a warning about downloading VMWare Tools. Download and install these tools.
12. When the VMware Tools have downloaded, you will see the Windows install screen. **Note:** This step may take some time, so be patient.
13. When the download is complete, your virtual machine will restart.
14. Complete the installation. **Note:** This step may take some time.
15. Remember to have your mouse cursor within the virtual machine and click anywhere inside it. To get it out of the virtual machine, hold *Ctrl* + *Alt*.

   Congratulations! You have successfully created a Virtual Windows 7 Professional or Windows 7 Enterprise Appliance.

   **Note:** The first time you log on, Windows will configure the desktop, and the VMware Tools will install. The virtual machine will then reboot, and you will be ready. Log in and begin your lab projects, as shown in Figure 2-7.

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**Figure 2-6: New Virtual Machine Wizard: Ready to create virtual machine**
16. After the machine has rebooted, log on as Administrator and begin configuring your server with the following information.

- **Computer name:** Student00
- **Password:** P@SSw0rd
- **Confirm password:** P@SSw0rd
- Set date and time according to your local time zone.
- **IPv4 address:** 192.168.1.21
- **Subnet mask:** 255.255.255.0
- **Workgroup:** BUSICORPWG

### Project 2.4 Configuring and Verify Installation

<table>
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<th><strong>Overview</strong></th>
<th>After the initial installation, you must configure your new Windows 7 Professional or Windows 7 Enterprise installation to work on your network.</th>
</tr>
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<tbody>
<tr>
<td><strong>Outcomes</strong></td>
<td>After completing this project, you will know how to:</td>
</tr>
<tr>
<td></td>
<td>▲ change a computer’s Name and IP address</td>
</tr>
<tr>
<td></td>
<td>▲ verify the current status</td>
</tr>
<tr>
<td><strong>What you’ll need</strong></td>
<td>To complete this project, you will need:</td>
</tr>
<tr>
<td></td>
<td>▲ a computer with Windows 7 Professional or Enterprise installed</td>
</tr>
<tr>
<td><strong>Completion time</strong></td>
<td>30 minutes (approximate, varies by computer)</td>
</tr>
</tbody>
</table>
Precautions  You must complete Project 2.3, in which you install Windows 7 Professional or Enterprise before starting this project.
If your computer is part of a network other than a dedicated or private training network, you should check with your network administrator before making any changes.

Part A: Configuring Windows 7 Professional or Windows 7 Enterprise

1. Log on to your Windows 7 Professional or Windows 7 Enterprise Virtual Machine and open the control panel by clicking Start/Control Panel, as shown in Figure 2-8.

2. Choose Network and Internet/View Network Status and Tasks, as Figure 2-9 shows.
3. Click on **Local Area Connection** and choose the **Properties** button from the **Local Area Connection Status** window (refer to Figure 2-10).

4. Highlight **IPv4** and choose **Properties**.

5. Click on **Use the following IP address** and type in the IP address and subnet mask given to you. Click **OK, Close, and Close again**, as Figure 2-11 shows.
6. Click **Start** and right-click on the computer icon. Choose **Properties**.

7. Choose **Change Settings** at the bottom right of the screen and click the **Change** button on the system properties screen, as shown in Figure 2-12. Type in your computer name and workgroup.

8. Click **OK** and you will see a welcome screen. You will then see a notice to restart your computer. Click **OK** and **Restart Now**, like in Figure 2-13.
Part B: Verify the Installation

1. When the Welcome screen displays, log on to your computer.
2. Open the Start menu, point to All Programs and then to Accessories, and then select the Command Prompt to open a command prompt window, like in Figure 2-14.

3. Type ipconfig and press Enter, like Figure 2-15 shows.
4. Verify that the computer name and IP address reported are the same as the values specified during installation.

5. Type `exit` and press `Enter` to close the **Command Prompt** window.

6. Open the **Start** menu and select **Shut Down**. Select **Turn Off** when prompted to shut down the computer.

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### Project 2.5 Mapping Network Components

**Overview**

Microsoft and other operating system manufacturers build network components into their operating systems. You can view and manage the status of these networking components. Many components also have parameters that you can configure to control how your computer communicates on the network.

Part of understanding these network components is knowing how they are related to each other. One way to do so is to map them to the appropriate network model layers. The standard model, even though it is not strictly adhered to by most manufacturers, is the OSI model. Other common models are the DoD model, which is also known as the TCP/IP model, and the Internet model. The DoD and Internet models are very similar, but do have two differences. The DoD model does not include a physical layer. Also, the layers are named differently, even though the layers in both the DoD and Internet models map to the same layers in the OSI model. The layers supported by both of these models are functionally identical.
Outcomes After completing this project, you will know how to:

- view networking components and parameters

What you’ll need To complete this project, you will need:

- the following worksheet
- a computer running Windows 7

Completion time 60 minutes

Precautions Do not make any changes to the computer’s configuration unless explicitly told to do so by the project steps. Otherwise, you will view only configuration parameters during this project.

You should be logged on as Administrator before starting this project.

This project assumes that the control panel is configured to show selections in classic view, as configured in Project 2.4. If it is not, you should configure the control panel for classic view before you start. The project steps direct you to display various network components and configuration parameters. You will also be asked to display the model layer to which the item belongs. For each component, identify the appropriate OSI, DoD, and Internet model layers and justify your selection.

1. Open the Start menu and select Control Panel.
2. Double-click Network Connections to open the Network Connections window.
3. Right-click your local connection and select Properties to open the Local Area Connection Properties dialog box, as shown in Figure 2-16.

![Figure 2-16: Local Area Connection Properties dialog box](image)

5. With which layer is this IP address information associated?

   OSI model: _______________________
   DoD model: _______________________
   Internet model: ___________________
6. Click Cancel to close the Internet Protocol (TCP/IP) Properties dialog box and then Cancel to close the Local Area Connection Properties dialog box. Close the Network Connections window.

7. Open a Command Prompt window, type ipconfig, and press Enter. How does the information reported compare to that in the Internet Protocol (TCP/IP) Properties dialog box.

___________________________________________________________________________
___________________________________________________________________________

8. What is the IP address?

___________________________________________________________________________

9. Type ipconfig/all in the Command Prompt window. What is the physical address value?

___________________________________________________________________________

10. In what numbering system is this reported?

___________________________________________________________________________

11. With which network model layer is this value associated?
   OSI model: 
   DoD model: 
   Internet model: 

12. Close the Command Prompt window.

13. Open the Start menu and select All Programs/Internet Explorer to launch the default Web browser, Internet Explorer.
    If configured with Internet access, the default home page will display.

14. With which network model layer is this application associated?
    OSI model: 
    DoD model: 
    Internet model: 

15. Open the Control Panel and launch the System and Security/Windows Firewall, as Figure 2-17 shows.
The Windows Firewall should be configured as shown in Figure 2-18.

16. If not configured as in Figure 2-18, change your configuration to match the figure.
17. Click *What else should I know about Windows Firewall*. What protections are listed? What risks not blocked by Windows Firewall are listed?

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

18. Close the **Help and Support Center** window.

19. Select the **Exceptions** tab in the **Windows Firewall** dialog box, select **File and Printer Sharing**, and click **Edit**. For what protocols are exceptions listed?

___________________________________________________________________________

___________________________________________________________________________

20. With which network model layer are these protocols associated?
   
   OSI model:  

   DoD model:  

   Internet model:  

21. Click **Cancel** to close the **Edit** dialog box and then click **Cancel** to close the **Windows Firewall** dialog box.